

Aluminium halohydrates are usually defined by the general formula $Al_2(OH)_xQ_y \cdot wH_2O$ in which Q represents chlorine, bromine or iodine, x is variable from 2 to 5 and $x + y = 6$ while wH_2O represents a variable amount of hydration.

- 5 Especially effective aluminium halohydrate salts, known as activated aluminium chlorohydrates, are described in EP-A-6739 (Unilever NV et al), the contents of which specification is incorporated herein by reference. Some activated salts do not retain their enhanced activity in the
- 10 presence of water but are useful in substantially anhydrous formulations, i.e. formulations which do not contain a distinct aqueous phase.

- Zirconium actives can usually be represented by the
- 15 empirical general formula: $ZrO(OH)_{2n-nz}B_z \cdot wH_2O$ in which z is a variable in the range of from 0.9 to 2.0 so that the value $2n-nz$ is zero or positive, n is the valency of B, and B is selected from the group consisting of chloride, other halide, sulphamate, sulphate and mixtures thereof. Possible
- 20 hydration to a variable extent is represented by wH_2O . Preferable is that B represents chloride and the variable z lies in the range from 1.5 to 1.87. In practice, such zirconium salts are usually not employed by themselves, but as a component of a combined aluminium and zirconium-based
- 25 antiperspirant.

- The above aluminium and zirconium salts may have co-ordinated and/or bound water in various quantities and/or may be present as polymeric species, mixtures or complexes.
- 30 In particular, zirconium hydroxy salts often represent a range of salts having various amounts of the hydroxy group.

Zirconium aluminium chlorohydrate may be particularly preferred.

Antiperspirant complexes based on the above-mentioned
5 astringent aluminium and/or zirconium salts can be employed.
The complex often employs a compound with a carboxylate
group, and advantageously this is an amino acid. Examples
of suitable amino acids include dl-tryptophan, dl-β-
phenylalanine, dl-valine, dl-methionine and β-alanine, and
10 preferably glycine which has the formula $\text{CH}_3\text{CH}(\text{NH}_2)\text{CO}_2\text{H}$.

It is highly desirable to employ complexes of a combination
of aluminium halohydrates and zirconium chlorohydrates
together with amino acids such as glycine, which are
15 disclosed in US-A-3792068 (Luedders et al). Certain of
those Al/Zr complexes are commonly called ZAG in the
literature. ZAG actives generally contain aluminium,
zirconium and chloride with an Al/Zr ratio in a range from 2
to 10, especially 2 to 6, an Al/Cl ratio from 2.1 to 0.9 and
20 a variable amount of glycine. Actives of this preferred
type are available from Westwood, from Summit and from
Reheis.

Other actives that may be utilised include astringent
25 titanium salts, for example those described in GB 2299506A.

The proportion of solid antiperspirant salt in a composition
normally includes the weight of any water of hydration and
any complexing agent that may also be present in the solid
30 active. However, when the active salt is in solution, its
weight excludes any water present.

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If the composition is in the form of an emulsion the antiperspirant active will be dissolved in the disperse phase. In this case, the antiperspirant active will often provide from 3 to 60% by weight of the aqueous disperse phase, particularly from 10% or 20% up to 55% or 60% of that phase.

Alternatively, the composition may take the form of a suspension in which antiperspirant active in particulate form is suspended in the water-immiscible liquid carrier. Such a composition will probably not have any separate aqueous phase present and may conveniently be referred to as "substantially anhydrous" although it should be understood that some water may be present bound to the antiperspirant active or as a small amount of solute within the water-immiscible liquid phase. In such compositions, the particle size of the antiperspirant salts often falls within the range of 0.1 to 200 μm with a mean particle size often from 3 to 20 μm . Both larger and smaller mean particle sizes can also be contemplated such as from 20 to 50 μm or 0.1 to 3 μm .

Optional ingredients

Optional ingredients in compositions of this invention can include deodorants, for example at a concentration of up to about 10% w/w. Suitable deodorant actives can comprise deodorant effective concentrations of antiperspirant metal salts, deoperfumes, and/or microbicides, including particularly bactericides, such as chlorinated aromatics, including biguanide derivatives, of which materials known as triclosan eg Irgasan DP300 [™], Tricloban [™], and Chlorhexidine